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SECTION II.—GENERAL METEOROLOGY.

ON A METHOD FOR CLASSIFYING WINTERS.[1]

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The comparison of the temperatures of different winters presents some difficulties, particularly from the point of view of their influences on agricultural phenomena. The monthly means are certainly inadequate, for one month (e. g., February, 1913) may have a mean temperature that is close to the normal while the month had presented two quite different periods of which one was very warm and moist while the other was cold and dry. Equally unsatisfactory is an examination relying upon absolute extreme temperatures; the unusually warm winter of 1911–12 had but two very cold days, in February, when the temperature at Parc Saint-Maur fell to −10° C., and this temperature if considered alone would lead us to class among the cold winters precisely the warmest one on record.

The influence of cold periods on the phenomena of vegetation depends both on their intensity and their duration. It is therefore necessary to seek for some method of presentation that will take into account both these elements. The simplest method seems to be to use the sum of the daily minimum temperatures that fall below 0° in each month. For example, in January, 1913, at Parc Saint-Maur there were but four "days of frost": −1.6°C. on the 1st, −0.5° on the 10th, 0.0° on the 26th, and −2.0° on the 27th; the sum of these four numbers is 4.1°, or 4° in round numbers—which are close enough, for although it is necessary to retain the tenths in the individual numbers in order to obtain an exact sum it seems illusory to retain them when discussing the sum itself.

The following table, Table 1, gives the values obtained in this manner at Parc Saint-Maur for the whole series of observations covering exactly 40 years. The values for October and November, 1872, when observations had not yet begun at Parc Saint-Maur, have been interpolated from observations taken at Versailles by taking into account the mean difference between the minima at the two stations. In the table leaders (.....) indicate there was no temperature below freezing during that month. 0 indicates that there were one or two days of very light freezing and that the sum of the negative temperatures does not amount to 0.5°C. The total for the year sometimes differs by unity from the number written in the last column headed "Totals," because in order to obtain the latter the decimals belonging to each month have been used.

The average annual total of minimum temperatures below 0°C. at Paris is 198.7°C., or in round numbers 200°C. The annual total varies within very wide limits from year to year (e. g., from 52° for 1872–73 to 588° for 1879–80); therefore it provides a good criterion for classifying winters. The winters that furnished the largest and the smallest sums are, respectively:

	°C.		°C.
1879–80	588	1872–73	52
1890–91	447	1883–84	59
1894–95	412	1911–12	61
1887–88	323	1876–77	75

The 32 other winters of the period considered have all given numbers above 100° and below 300°. For the present winter (1912–13) up to March 12, 1913, the sum is 73.5; it therefore ranks fourth among mild winters and will pass to fifth place if, as is probable, not less than one or two days of light frost occur.

One could likewise take into account the daily maximum temperatures that fall below 0° in making up this table. This would emphasize still further the contrast between the mildest and the severest winters without essentially changing the general character of the winters.

It would certainly be interesting to calculate similar sums for some other stations where we possess long series of observations made under favorable conditions, and to compare the resulting data with the phenomena of vegetation.

In the accompanying table one should notice the two months December, 1879, and February, 1895; both present sums of negative temperatures in excess of the average annual sum. The influence of these two exceptional months raises the general averages for December and February. This is particularly striking in the case of December, which, at the end of a very great number of years, should present a much greater contrast with the average sum for January than is shown by the table.

TABLE 1.—*Sums of minimum temperatures below 0°C. at Parc St. Maur, Paris.*

Winter.	October.	November.	December.	January.	February.	March.	April.	May.	Year.
									°C.
1872–73	1	1	2	12	27	5	4	.....	52
1873–74	1	9	46	21	48	23	1	2	151
1874–75	2	32	88	25	54	24	2	.....	227
1875–76	1	17	67	112	71	11	6	.....	284
1876–77	1	19	2	18	7	28	.....	0	75
1877–78	14	.....	31	42	17	11	2	.....	118
1878–79	.....	6	72	86	15	6	7	.....	192
1879–80	2	40	391	122	31	3	.....	.....	588
1880–81	11	19	3	153	13	15	2	.....	215
1881–82	13	6	31	40	50	2	1	.....	143
1882–83	0	0	15	21	18	66	2	.....	122
1883–84	.....	4	16	4	11	16	8	.....	59
1884–85	2	38	24	119	2	20	.....	0	205
1885–86	.....	8	40	59	40	56	1	.....	204
1886–87	.....	2	35	73	66	62	5	.....	243
1887–88	13	16	54	87	100	43	9	.....	323
1888–89	14	.....	42	63	52	47	.....	.....	218
1889–90	.....	10	32	15	50	41	1	.....	200
1890–91	13	42	181	135	50	20	6	.....	447
1891–92	3	35	60	67	30	62	9	2	268
1892–93	1	.....	88	159	14	7	1	.....	270
1893–94	1	28	39	64	36	4	.....	.....	171
1894–95	.....	10	17	105	243	37	.....	.....	412
1895–96	8	3	10	34	51	2	0	.....	109
1896–97	.....	37	17	41	6	5	1	.....	106
1897–98	3	28	52	31	20	21	1	.....	155
1898–99	.....	4	38	15	48	52	0	.....	157
1899–1900	3	10	114	16	27	22	4	.....	195
1900–1901	2	3	1	56	101	24	1	.....	188
1901–02	1	45	30	23	62	4	0	1	165
1902–03	.....	34	75	47	31	13	3	.....	198
1903–04	.....	6	49	60	25	24	.....	.....	163
1904–05	1	27	25	82	17	2	4	.....	158
1905–06	15	17	25	28	31	17	2	.....	134
1906–07	.....	5	31	53	72	14	4	.....	230
1907–08	.....	7	19	124	22	27	5	.....	203
1908–09	5	27	62	73	68	31	3	2	270
1909–10	.....	27	32	37	24	7	4	.....	130
1910–11	.....	17	14	51	38	9	12	.....	141
1911–12	.....	5	1	21	32	.....	2	.....	61
Average	3.3	16.1	51.7	59.8	42.7	21.9	3.0	0.2	198.7

[1] Angot, A. Sur un mode de classification des hivers. Annuaire de la Soc. météorol. de France, Paris, Avril, 1913, 61 : 109–112.